Small Business Innovation Research/Small Business Tech Transfer

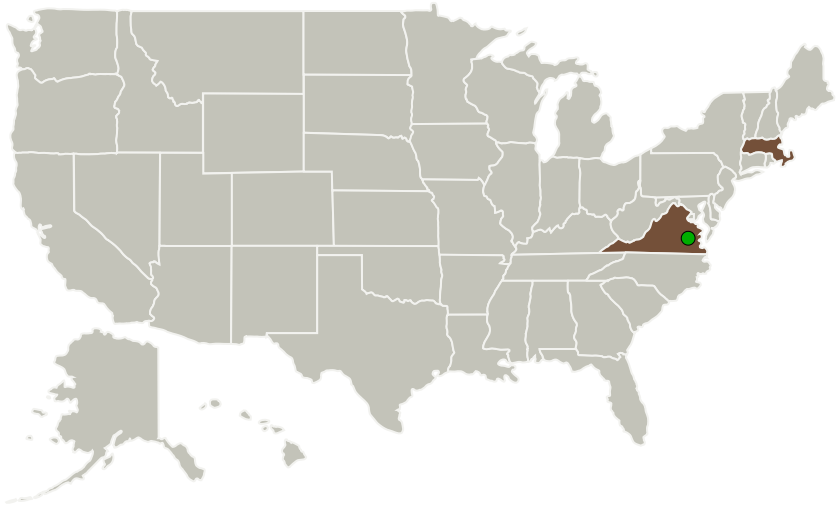
CNT Applique for SHM of Space Structures, Phase I

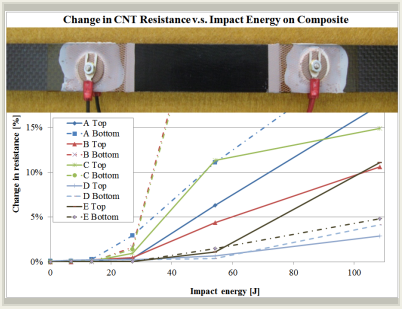
Completed Technology Project (2014 - 2014)

Project Introduction

Space structures are unique in that once they are deployed, there is little to no opportunity for manual inspection to assess their integrity. Even on the space station, where there is a continuous human presence, traditional non-destructive evaluation (NDE) is impractical due to complexity of necessitating a space-walk, not to mention the training required to obtain meaningful results. These structures are subject to damage caused by the extreme launch environment, micrometeorite and orbital debris (MMOD) impact, thermal cycling and even atomic-level corrosion. Nevertheless, it is desirable for space structures to be designed with as small safety margins as possible due to the significant cost of placing objects into space. Therefore, NASA seeks reliable structural health monitoring (SHM) techniques to be able to remotely inspect space structures. Such a system could be used as an early warning system for manned space missions, to indicate when a critical repair may need to be conducted, or an emergency abort event is necessitated. MDC proposes the use of a conformal CNT applique for providing SHM capabilities to space structures while only adding 10 GSM mass and 100 micron thickness. Four separate detection methods will be demonstrated using the multi-physics properties of this unique material.

Primary U.S. Work Locations and Key Partners





CNT Applique for SHM of Space Structures Project Image

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Organizations Performing Work	Role	Type	Location
Metis Design Corporation	Lead Organization	Industry	Boston, Massachusetts
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

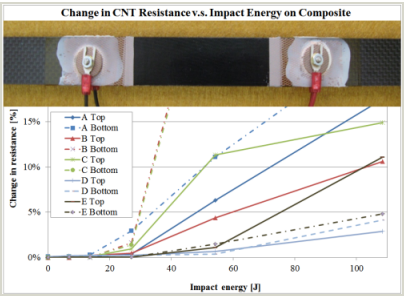
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137794)*

Images



Project Image
CNT Applique for SHM of Space Structures Project Image *(https://techport.nasa.gov/image/127040)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Metis Design Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

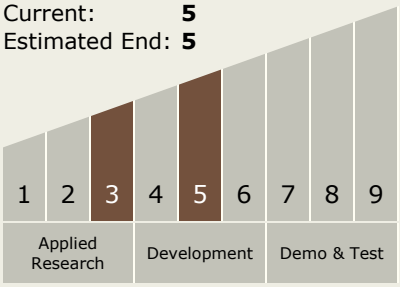
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Seth Kessler

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.3 Mission Operations and Safety
    - TX07.3.2 Integrated Flight Operations Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System